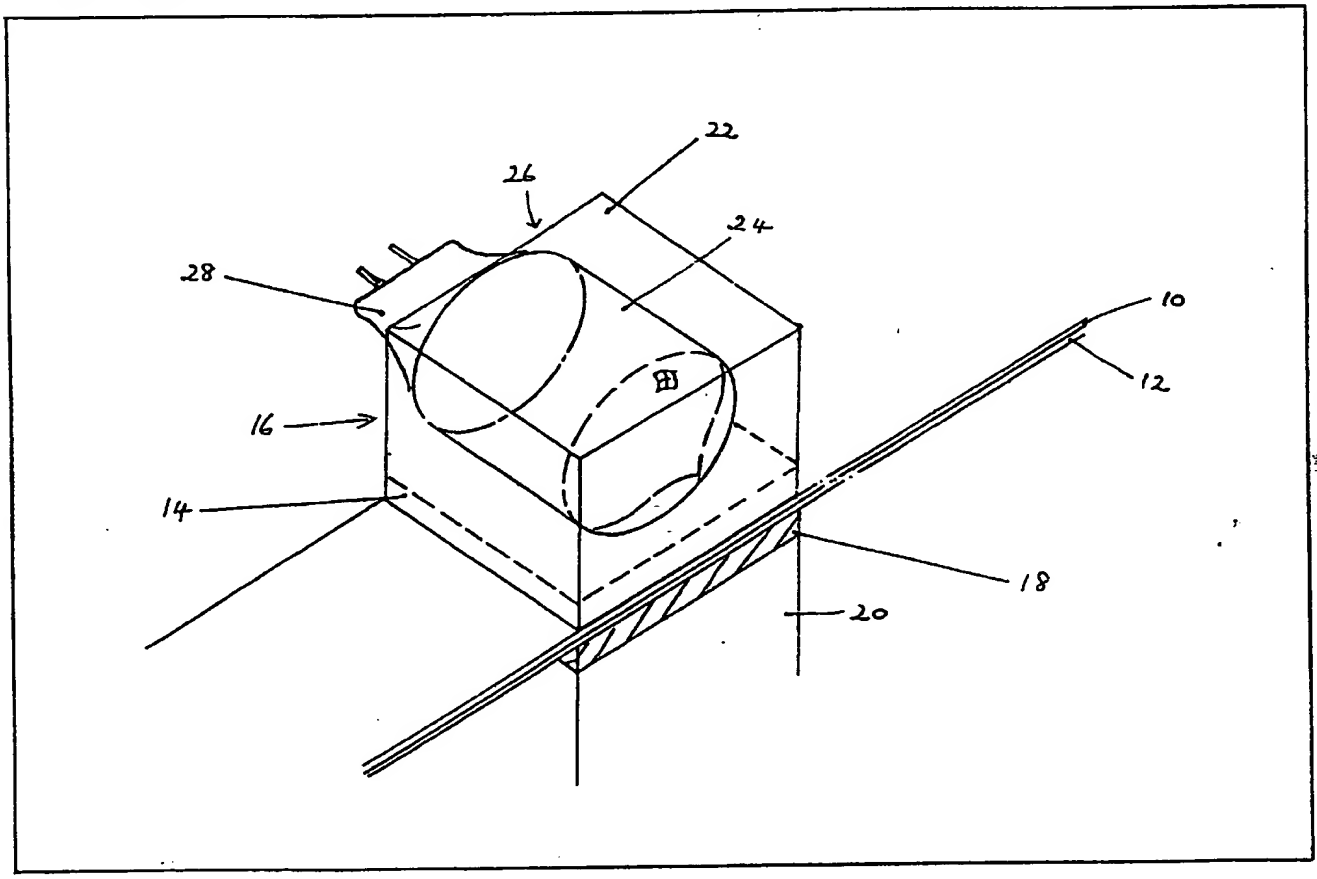
(12) UK Patent Application (19) GB (11) 2 103 147 A

(21) Application No 8123906
(22) Date of filing 5 Aug 1981
(43) Application published
16 Feb 1983
(51) INT CL³
B29C 27/02
(52) Domestic classification
B5K 3A2 3AX1 3D
U1S 1815 B5K
(56) Documents cited
GBA 2004497
GB 1316373
GB 1236636
GB 1216516
GB 1027528
GB 0938249
GB 0821438
(58) Field of search
B5K
(71) Applicants
PA Management
Consultants Limited
(Great Britain),
Hyde Park House, 60a
Knightsbridge, London
SW1X 7LE
(72) Inventor
Graham Paul Ford
(74) Agents
Keith W. Nash and Co.,
22 Hills Road, Cambridge
CB2 1JP

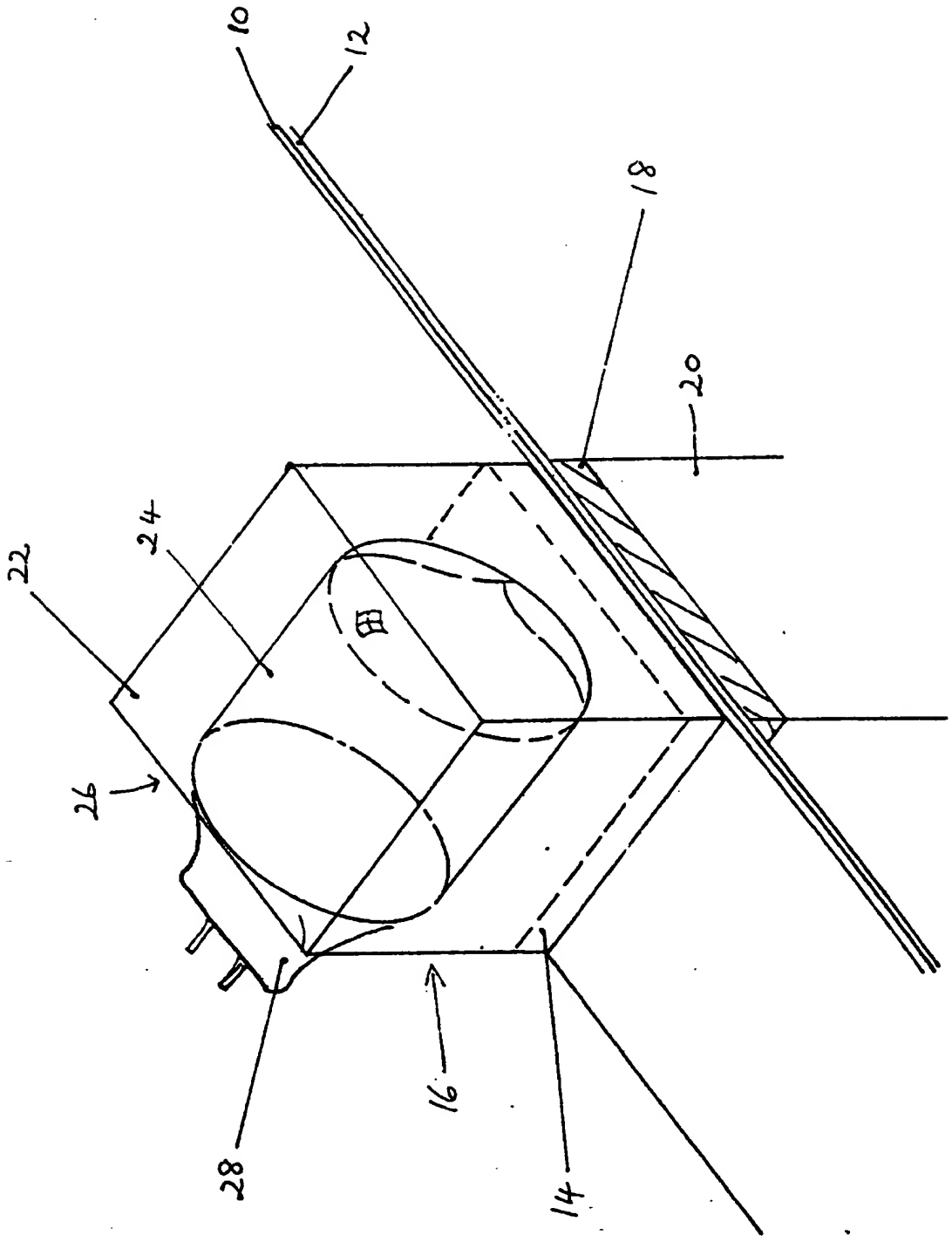
(54) **Heat sealing of thermoplastics materials**

(57) A method of and apparatus for heat sealing together two lengths of a thermoplastics strap looped and tensioned around a package and having relatively thick translucent and relatively thin opaque composite layers, wherein the two strap lengths 10, 12 are pressed against the window 14 of a tungsten-halogen lamp assembly 16 with the opaque layer of the lamp-side strap length 10 in pressure contact with the other strap length 12, and the contacting strap lengths are irradiated through the window with a high intensity transmission concentrated by reflectors so that the opaque layer of the lamp-side length melts and fuses to the other strap length to form a heat sealed joint therewith on cooling after the lamp has been switched off.



GB 2 103 147 A

This print takes account of replacement documents later filed to enable the application to comply with the formal requirements of the Patents Rules 1982.


10
12
18
20
22
24
26
16
28
14

SPECIFICATION

Improvements in heat sealing of thermoplastics materials

This invention relates to a method of and apparatus for heat sealing together two portions of a thermoplastics (heat-sealable) material, such as thermoplastics sheets or films or tapes to be spliced together. More especially, however, the method and apparatus is applicable to the sealing together of two lengths of a thermoplastics strap which has been looped and tensioned around a package in order to secure it.

In the packaging industry, it is a common requirement to tension and secure a thermoplastics strap around the periphery of a package. In ofer to secure the tensioned loop, two layers of strap must be fixed together where they overlap at the common beginning and end of the loop.

Mechanical fastenings such as metal clips crimped around the two strap layers or deformable wire buckles locking to the two strap layers produce a structurally inefficient joint and are expensive to produce and handle.

Friction welding, wherein a flat or cylindrical pad is oscillated parallel to the plane of contact of the two strap layers in pressure contact therewith can also result in a structurally inefficient joint for some types of strap, especially a strap of polyester and, in addition, an uncomfortable amount of noise is generated. Furthermore, the high power required necessitates use of a compressed air or mains electric drive.

Ultra-sonic welding is equally disadvantageous, being less successful for some types of strap than others, and requiring relatively complex circuitry for providing the necessary operating power.

A known heat sealing process also demands use of a high power source external to the sealing equipment. In this process, a continuously or intermittently heated, relatively massive, heating element is caused to enter between the two layers of strap by moving said element across the strap from one longitudinal edge to the other. The two strap layers are first pressed against the heating element and then, after a short delay, the element is rapidly retracted and the two strap layers are pressed together at the heated regions thereof. This process, in addition to disadvantageously requiring an external power source, produces considerable unpleasant fumes, since the operating temperature is necessarily higher than the decomposition temperature of the strap material.

More generally, the known methods require a relatively complex heat sealing tool which generally includes a moving element for effecting heating, rendering said element liable to accidental damage if improperly used.

It is an object of this invention to provide an improved apparatus and method for heat sealing thermoplastics materials, more especially wherein the use of a moving element for heating is avoided.

According to one aspect of the invention, there is provided apparatus for heat sealing together two portions of a thermoplastics material at least one of which has a light-absorbing layer, comprising a casing having a light-transmitting window on one side and reflective internal surfaces except on said one side, means for mounting and for supplying power to a tungsten-halogen light source within the casing, means for relatively positioning the lamp and the portions of thermoplastics material so that radiation will penetrate the light-transmitting layer of one portion to fuse the light-absorbing layer thereof to the other portion of thermoplastics material, and means for pressing the two portions of thermoplastics material together during irradiation.

According to a second aspect of the invention, there is provided a method of heat sealing together two portions of a thermoplastics material at least one of which has a light-absorbing layer, according to which the two portions of thermoplastics material are pressed together, and irradiated through the light-transmitting layer of one portion by a tungsten-halogen light source transmitting reflectively gathered light, e.g. light transmitted through the window of an internally reflective surround for the light source.

In its application to packaging, the present invention in a preferred aspect requires the use of a composite thermoplastics material, i.e. thermoplastics packaging strap, which is formed of two layers, in general a relatively thick light-transmitting layer and a relatively thin light-absorbing layer. However, such a composite strap material need not be appreciably more expensive than a homogeneous strap material, and any such additional costs are offset by the heat sealing apparatus and method of this invention when applied to such a composite thermoplastics material.

Preferably, the casing or surround is a right-rectangular box internally reflective, e.g. by means of polished aluminium, on five internal faces, with a window, conveniently formed by transparent glass of high transmissivity forming the sixth face.

The pressing means, such as a resilient pad formed by a rigidly backed foam rubber layer, can act to press the two portions of thermoplastics material together against the window. A hinged mounting will permit the pressure to be relieved.

If desired, the internally reflective casing or surround, the window and a tungsten-halogen source may be formed as an integral lamp structure.

A practical arrangement in accordance with the invention will now be described by way of example with reference to the accompanying drawing, in which:—

the single figure shows the practical arrangement diagrammatically in perspective.

In the drawing, the references 10, 12 denote two lengths of a thermoplastics strap which is formed with two integral layers (not shown), namely a relatively thick light-transmitting or

translucent layer and a relatively thin light-absorbing or opaque (dark or black) layer.

The two strap lengths 10, 12 are pressed together up against the window 14 of a tungsten-halogen lamp assembly generally referenced 16, the opaque, light-absorbing layer of the upper strap length 10 being lowermost and in contact under pressure with the lower strap length 12. The necessary pressure is obtained by a foam rubber pad 18 carried by a rigid support 20. By means not shown the rigidly backed pad can be hinged away from the window to relieve the pressure.

The lamp assembly 16 comprises a right-rectangular casing 22 internally reflectively faced, except for the window 14, with polished aluminium. A tungsten-halogen bulb 24 is located internally of the casing 22 by a mounting in one internally reflecting face 26, the base connector for supply of power being referenced 28.

In use, with the two thermoplastics strap layers 10, 12 pressed together against the window 14 by the pad 18, the lamp 16 is switched on. The radiant energy, primarily in the visible wavelength range, is concentrated through the window 14 in a high intensity transmission, and passes through the translucent layer of the strap length 10 into the opaque layer thereof. This being a thin layer, it melts due to absorption of the high intensity radiation, and fuses to the other strap length 12 immediately below it and by virtue of the pressurised contact maintained by the resilient pad 18. When the lamp is switched off, the melted thermoplastics material cools and a fused joint is formed between the two strap lengths 10, 12.

Various modifications are possible within the scope of the invention, especially in fields other than packaging. For example, in the sealing together of thermoplastics sheet, it may be practicable to use two opposed tungsten-halogen lamps which are urged together to squeeze the two sheets between them. Although not shown, the lamp assembly, with its internal reflectors, window and tungsten filament, can be formed as an integrated structure.

CLAIMS

1. Apparatus for heat sealing together two portions of a thermoplastics material at least one of which has a light-absorbing layer, comprising a casing having a light-transmitting window on one side and reflective internal surfaces except on said one side, means for mounting and for supplying power to a tungsten-halogen light source within the casing, means for relatively positioning the lamp and the portions of thermoplastics material so that radiation will penetrate the light-transmitting layer of one portion to fuse the light-absorbing layer thereof to the other portion of thermoplastics material, and means for pressing the two portions of thermoplastics material together during irradiation.

2. Apparatus according to claim 1, wherein the window is formed by a transparent glass of high light-transmissivity to radiation from a tungsten-halogen lamp.

3. Apparatus according to claim 1 or claim 2, wherein the casing is a right-rectangular box internally reflective on five faces.

4. Apparatus according to claim 1 or claim 2 or claim 3, wherein the reflective internal surfaces are formed by polished aluminium.

5. Apparatus according to any of claims 1 to 4, wherein the pressing means acts to press the thermopastics portions together against the light-transmitting window.

6. Apparatus according to claim 5, wherein the pressing means comprises a resilient pad.

7. Apparatus according to claim 6, wherein the pad is of foam rubber backed by a rigid support.

8. Apparatus according to claim 6 or claim 7, wherein the resilient pad is hingedly mounted to apply and to relieve the pressure.

9. Apparatus according to any of claims 1 to 8, wherein the internally reflective casing, the window and tungsten-halogen source are formed as an integral lamp structure.

10. A method of heat sealing together two portions of a thermoplastics material at least one of which has a light-absorbing layer, according to which the two portions of thermoplastics material are pressed together, and irradiated through the light-transmitting layer of one portion by a tungsten-halogen light source transmitting reflectively gathered light.

11. A method according to claim 10, wherein the light is transmitted through the window of an internally reflective surround for the light source.

12. A method according to claim 10 or 11, according to which the thermoplastics material has a relatively thick light-transmitting layer and a relatively thin light-absorbing layer.

13. A method according to claim 10 or claim 11 or claim 12, wherein the two thermoplastics portions are lengths of thermoplastics strap wrapped around a package.

14. Apparatus for heat sealing thermoplastics material substantially as hereinbefore described with reference to the accompanying drawings.

15. A method of heat sealing thermoplastics material substantially as hereinbefore described.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1983. Published by the Patent Office 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.